Leaky Buildings - the real issues surrounding timber treatment

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What is a leaky building?

A building where external moisture has entered, accumulated and caused damage to the building or its contents.

Key findings:
- Inadequate science
- Poor education
- Lack of accountability & responsibility
WEATHERTIGHTNESS SCIENCE

“All buildings leak”

NEED TO MANAGE MOISTURE

4 D’s

• Deflection
• Drainage
• Drying
• Durability
Examples of leaky buildings with Boron treated framing
Examples of leaky buildings with untreated Radiata pine framing
And problems in the supply chain...
What about Douglas fir?
What has been done?

- Greater weathertightness risk awareness among industry and public
- Drained & vented cavities now the norm
- Treated timber widely used
- Various reforms – DBH, LBP’s, accreditation of Councils

But....

- Increased litigation and WHRS claims
- And existing problem will remain for many years
So how big is the problem?

If all affected houses were properly repaired today:

- Houses built 1997 – 2003 $9 Billion
- Commercial buildings not included.
- Professional & legal fees not included.
- Does not include repairs that fail.

What damage has been done to structural timber?

- Significant loss of market in multi-unit residential
- Some loss of share in commercial market
- No significant change in the traditional housing market
Future threats to structural timber?

- Environmental and HSE concerns with treatment chemicals
- Excessive shrinkage/deflection due corewood, juvenile timber or compression wood
- Wood boring insects?
- Factions within the timber industry

Lessons from the past

New Zealand Timbers – The complete guide to exotic and indigenous woods. N.C. Clifton.

“There were two big breakthroughs in the use of the species [Radiata pine] in this country; the first being an introduction of grading rules for sawn timber in 1938, … The second major development was the coming into being in this country, through the 1950s, of a sophisticated wood preservation industry…..”
What is required?

• Timber that is reliable & dependable.
• Timber treatment that is safe.
Leaky Buildings – the real issues surrounding timber treatment

Many people think 'leaky buildings' are about water leaks that are obvious to the homeowner, buckets to collect dripping water and so forth. Whilst this can be the case, most leaky buildings I encounter appear to be dry and comfortable.

So what is a ‘leaky building’?

It is a building where external moisture has entered past the external weathertight building envelope and has accumulated and caused damage to the building, the building elements or to its contents.

The issue of weathertightness was an increasing concern during the 1990’s. The Claddings Institute of New Zealand held an Industry Forum on Weathertightness in May 2000. This is the first time a large representative group of the building industry had gathered together to try to understand and grapple with this problem.

Whilst the views were as diversified as the audience, there was general agreement that there was a problem and that something had to be done. The key findings of that forum were that the weathertightness problems were largely due to inadequate science, poor education and a lack of accountability and responsibility throughout the building industry.

It was not until the Hunn report was published in the latter part of 2002 that change really gathered momentum.

First, I want to examine the issue of weathertightness science. It is fundamental to accept that all buildings will leak at some time during their life. I do not think there be a person in the room who has not experienced building leaks.

The message is not to just focus on keeping water out. The need is to manage moisture, to allow it to escape and prevent it from doing damage.

Weathertightness science is based around the concept of the ‘4 D’s’. i.e. deflection, drainage, drying and durability. We understand deflection is provided by roof eaves, but it also encompasses flashings, paint coatings and so forth. It is the means by which we prevent water entering in the first instance. Drainage and drying allows moisture to escape ‘in volume’ by drainage and with the remaining moisture by drying. Drying can be in the form of evaporation or diffusion. The issue I want to cover is durability of the wall components and in particular, durability of the timber framing.

First I will give some examples of some leaky buildings with traditional boron-treated framing. By traditional boron-treated framing, I mean green boric treated which typically had a boron acid equivalent of 0.4% or more.
The first house was constructed around 1994 from wet boric-treated framing. The external cladding was stucco plaster. There were no flashings between the bottom of the joinery and the cladding. As a consequence, this wall had been leaking and wet for over 10 years. Whilst the decay is not spectacular, decay was present in the form of soft rot and probably with pockets of brown rot. In this particular house, a small amount of the timber framing needed to be replaced. Of note is the absence of any evidence of excessive dampness on the internal linings. As such you can see that the owners were largely unaware of the degree and extent of leaking.

In the next example we see a timber joist, which has been wet for a number of years as evidenced by the black bitumen kraft-based building paper, which has largely disappeared. Again, the leakage had been occurring for a number of years.

The next examples show buildings that are comprised of untreated kiln-dried Radiata pine. The first example is of a badly rotted timber joist from a building less than two years old. It would have experienced a comparable amount of dampness to the previous slide. Needless to say, the repair was extensive, with a team of carpenters taking some weeks to replace the decayed timber framing.

In the next slide we have a view of a balcony again about two years old. One of our consultants had warned the owner not to use the balcony. This was completely justified when the tiles and so forth were removed to reveal little left of the underlying timber joists!

For a time, some in the timber industry tried to point the finger at builders’ inability to make buildings waterproof i.e. keep water out, but there were also problems in the supply chain becoming increasingly evident.

I visited a large Auckland timber supply depot during 2001. I had heard there were a large number of timber packets that were rotten in their yard. These were stored outside with plastic covers as shown. The timber framing was extensively decayed. It had been in the timber yard for a few months. It was being sold as boxing-grade to builders, but I suspect much of it ended up in houses.

What about Douglas Fir?

Whilst it is more durable than untreated Radiata pine, given damp wall cavities, it will also decay, often quite spectacularly, as shown in this slide.

So what has been done to overcome the leaking building problem in New Zealand?

First of all there is a much greater awareness of weathertightness risk among both the building industry and the public. Certain types of houses are now less popular and developers and builders have altered their construction styles to be more conservative.

Drained and vented cavities behind claddings are now the norm. This even extends to weatherboards, where the industry has realized it is much easier to build with a few timber battens rather than forming difficult window flashings.

With the external insulation finish systems, such as Insulclad and Rockcote, polystyrene is used as battens at an additional cost per square metre of $5. Accordingly, very little polystyrene-based cladding is now installed without a cavity.
The other significant change has been the requirement for treated timber. I am not sure how much untreated timber is now used. I suspect the majority of framing installed into buildings today is now treated. Personally, based upon my experience with untreated pine, I would not use untreated timber structurally. Radiata pine sapwood is just too vulnerable to certain brown rots through its lack of naturally protective extractives and its moisture absorbency.

The leaky building problem has also highlighted problems at Government and at local council level. This has led to the formation of the Department of Building and Housing which is a more active regulator than the earlier Building Industry Authority. Local Councils have become far stricter, especially in light of the significant amount of litigation and claims under the Weathertight Homes Resolution Service Act. There will be accreditation of Councils as Building Consent Authorities. There also will be changes throughout the building industry in the form of the Licensed Building Practitioner scheme, which will capture both designers and builders.

Unfortunately the use of less than adequate claddings in combination with untreated timber framing will leave a legacy of failed buildings, litigation and WHRS claims, which will continue for many years.

**How big is the problem?**

I estimate that if all affected houses were properly repaired today, that the cost of repair of houses built between 1986 and 1996 that is with treated timber, could be in the order of $3 billion. I estimate that for houses built between 1997 and 2003, which are largely comprised of untreated timber, could cost in the order of $9 billion to repair.

These are substantial sums. However these buildings will not all emerge at once. There is a natural degree of denial and the problem tends to be latent so that repairs will extend over a number of years.

I have not included commercial buildings. These have also been affected. I have not allowed for professional or legal fees. The growth and demand for legal services in this area is significant. The Government’s WHRS scheme, which was supposed to avoid expensive legal costs, has not been successful due to the significant cost involved in repairing buildings. No one, be it the builder or the council, is going to hand over large sums of money without a fight. There is also often unfairness in the claims as the repairs need to correct both faults in construction and the inadequate claddings and timber they were given to use.

**What is the effect or damage to structural timber in this country?**

There has been a significant loss of share in the multi-unit residential market. Many of these building are now reinforced concrete. There has been some loss of share in the commercial market, but this is not as pronounced. However there appears to be no significant change in the traditional housing market.

Most people seem to have understood the problem has been caused by inadequate claddings, made worse by untreated timber. Since both issues have been largely dealt with, the potential for ongoing damage to new buildings is limited.

FIEA Annual Conference Presentation 2006
Are there any future threats to structural timber?

The most obvious would be both environmental and ‘health and safety’ concerns surrounding treatment. Boron is a benign and relatively safe chemical, but other more exotic treatments and their organic carriers, do raise concern.

There are other issues, such as excessive shrinkage and deflection of timber. This can be due to corewood, juvenile timber or the frequent occurrence of compression wood in Radiata pine. There have been moves in recent times to address weaker and less stiff timber, with changes to various timber Standards. Shrinkage related deformation is significantly reduced by the use of kiln dried timber, but problems with movement can remain, which can lead to disappointed building owners.

The ongoing threat of imported wood boring insects should never be discounted.

Lastly we have the timber industry itself. Factions within the industry drove the move to untreated timber. They were amply warned by scientists at Forest Research but they did not listen. There actions may have damaged the industry’s reputation, but more importantly think of the damage and heartache they have caused to many homeowners.

So, what is required?


“There were two big breakthroughs in the use of this species (Radiata pine) in this country - the first being an introduction of grading rules for sawn timber in 1938. The second major development was the coming into being in this country, through the 1950’s, of a simplificated wood preservation industry.”

The building industry needs to produce structural timber and products that are both reliable and dependable.

Accordingly, treatment of Radiata pine will always be needed. Such treatment needs to be safe, both in terms of the environment and the workplace.

The timber industry needs to support ongoing research of timber and timber treatment. This cannot be left solely to commercial factions. Good research will allow the timber industry to prosper and to properly engage in the regulatory process as a responsible industry.

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